

## Entropy Practice Problems

- 1) Predict the sign of  $\Delta S$  for the following:
  - (a) A lake freezing
  - (b) Precipitating lead chloride
  - (c) A candle burning
  - (d) Weeding a garden
- 2) Predict the sign of  $\Delta S^\circ$  for each of the following reactions:
  - (a)  $\text{Mg (s)} + 2 \text{H}_2\text{O (l)} \rightarrow \text{Mg(OH)}_2 \text{ (s)} + \text{H}_2 \text{ (g)}$
  - (b)  $2 \text{K (s)} + \text{Cl}_2 \text{ (g)} \rightarrow 2 \text{KCl (s)}$
  - (c)  $2 \text{NH}_3 \text{ (g)} \rightarrow \text{N}_2 \text{ (g)} + 3 \text{H}_2 \text{ (g)}$
- 3) Using Appendix 4 on A19 in the back of your textbook, calculate  $\Delta S^\circ$  for each of the following reactions:
  - (a)  $4 \text{NH}_3 \text{ (g)} + 7 \text{O}_2 \text{ (g)} \rightarrow 4 \text{NO}_2 \text{ (g)} + 6 \text{H}_2\text{O (g)}$
  - (b)  $\text{CH}_4 \text{ (g)} + 3 \text{Cl}_2 \text{ (g)} \rightarrow \text{CHCl}_3 \text{ (l)} + 3 \text{HCl (g)}$
  - (c)  $2 \text{H}_2\text{S (s)} + 3 \text{O}_2 \text{ (g)} \rightarrow 2 \text{H}_2\text{O (g)} + 2 \text{SO}_2 \text{ (g)}$
- 4) For each of the following pairs, choose the substance with the higher entropy per mole at a given molecule:
  - (a) Ar (l) or Ar (g)
  - (b) He (g) at 3 atm or He (g) at 1.5 atm
  - (c) 1 mol of Ne (g) in 15.0 L or 1 mol of Ne (g) in 1.5 L
  - (d)  $\text{CO}_2 \text{ (g)}$  or  $\text{CO}_2 \text{ (s)}$
- 5) The normal boiling point of methanol ( $\text{CH}_3\text{OH}$ ) is  $64.7^\circ\text{C}$  and its molar enthalpy of vaporization ( $\Delta H_{\text{vap}}$ ) is  $71.8 \text{ kJ/mol}$ . Calculate the value of  $\Delta S$  when  $1.00 \text{ mol}$  of  $\text{CH}_3\text{OH (l)}$  is vaporized at  $64.7^\circ\text{C}$ .